Improving Predictability With Clear Aligners and AcceleDent

by David S. Ostreicher, DDS, MS, MPH

Introduction

Advances in technology and materials have encouraged clinicians to expand the types of cases they are willing to treat with clear aligners. Yet some tooth movements with Clear Aligner Therapy still remain unpredictable, which prevents clinicians from achieving their desired results. Unlike cases where the result relies primarily on tipping teeth, which is fairly predictable, cases that require the expression of more difficult tooth movements (such as intrusions, extrusions, rotations, and root torque) tend to be far more challenging for clinicians to address with aligners than with braces.

Dr. David Ostreicher's health-oriented orthodontic practice is in Long Island, New York. An Invisalign Top 1% doctor and an Align Technology lecturer, Ostreicher has been offering AcceleDent for more than 5 years. He is professor emeritus at Columbia University and the University of New Haven. Ostreicher is a member of the American Dental Association, the American Association of Orthodontists, the American Public Health Association, and the Honorary Dental Society. After serving many years on the board of directors of the Nassau County Dental Society, he became president of the New York State Dental Association.

Dr. Ostreicher graduated from Clark University and attended Columbia University School of Dental Medicine, where he received his dental degree and certificate of specialty in orthodontics.

In these instances, when tooth movements don't track according to the outcome predicted in the ClinCheck® software, clinicians often need to order several refinement aligners, causing a ripple effect on length of treatment and patient compliance. Managing patient expectations is important, as significant changes during the course of treatment can increase the possibility that patients will disengage from treatment.

I've noticed a significant improvement in predictability, length of treatment, and patient motivation in my private practice since I began integrating AcceleDent® into my clear aligner cases. In the growing accelerated orthodontic market, AcceleDent stands out as the only vibratory device that is an FDA-cleared, Class II medical device designed specifically to speed up tooth movement. This is very important to me because I would feel very uncomfortable prescribing a device to my patients that is not held to performance standards. It's a matter of reputation and clinical experience.

Pulsatile forces—like those employed by AcceleDent's SoftPulse Technology®—have been used in orthopedics since the 1980s, and been proven to alter the physiological response in long bones by increasing the rate of fracture healing and increasing the cellular signaling that enhances bone density. In orthodontics, low pulsatile forces have been shown to stimulate bone metabolism molecules that regulate the quantity and activity of osteoclasts and osteoblasts.[1] There are several studies dating back to 2003 that support AcceleDent's claim of speeding up bone remodeling and tooth movement by as much as 50 percent.[2-5]

The "Ostreicher Theory"

From this growing body of evidence, I've developed the "Ostreicher Theory," describing yet an additional mechanism that may come into play to explain how AcceleDent's low pulsatile forces help to improve predictability with clear aligners while decreasing discomfort.

When moving a tooth with aligners, the goal is to push the tooth halfway through the periodontal ligament. This compresses the blood vessels just enough to cause relative hypoxia, which stimulates activity in the osteoclasts and osteoblasts. However, pushing a tooth too hard, or changing aligners too quickly, will force the tooth up against the lamina dura. This will totally compress the vessels, causing a complete lack of oxygen, or anoxia. This kills the osteoclasts, thus stopping or slowing movement, in addition to causing pain or discomfort.

AcceleDent's dual mechanical pathways—biochemical and physical—create an environment at the cellular level that fosters optimal blood and oxygen flow as well as tooth movement. As previously mentioned, the biochemical effects of bone growth and movement have been studied and proven in orthopedics and orthodontics. The physical mechanics are at play when AcceleDent's gentle vibrations move the tooth back and forth in the periodontal ligament, acting as a pump to push blood in and out of the area. This forces fluids and oxygen into the area, preventing anoxia and causing hypoxia instead. The results are that osteoclasts are not destroyed, teeth move faster, and patients experience less discomfort.

Proven clinical data published in peer-reviewed journals show that AcceleDent's low pulsatile forces effectively speed up tooth movement. AcceleDent's vibrations are delivered at an ideal low frequency (30 Hz) to foster pump-like movements. Vibrations at much higher frequencies are inefficient, because there is not enough time between cycles to allow fluids to flow in and out of the ligament, an effect similar to what happens in cardiac

fibrillation. The resulting "periodontal fibrillation" would not alleviate the anoxia.

Since we have to be cautious of changing aligners too fast, I begin all of my patients on a 14-day wear protocol for the first 2 weeks and instruct them to use AcceleDent. I see my patients every 5 to 6 weeks, so if the teeth are tracking according to the ClinCheck on their next appointment, I update the protocol to have them change their aligners every 10 days. Then, if everything continues to track as planned, I move them to a 7-day aligner wear protocol, then to 5 days, and eventually to 3.5 to 4 days.

This is the opposite of the new aligner protocols that suggest a 7-day wear interval without acceleration and then moving the patient to a 14-day interval if the aligner fit is not optimal. Patients may view going from a 7-day to a 14-day wear interval as punishment. In contrast, my protocol of gradually decreasing the aligner wear intervals offers positive reinforcement that motivates patients and encourages compliance throughout treatment.

Case presentation

Patient

- 35-year-old male

Diagnosis

- Class I
- Crowding
- Anterior crossbite

Mechanics

- Invisalign
- 28 aligners
- No refinement

Estimated Treatment Time: 14 months

Actual Treatment Time with AcceleDent: 6 months, 5 days

Figure 1: before treatment.

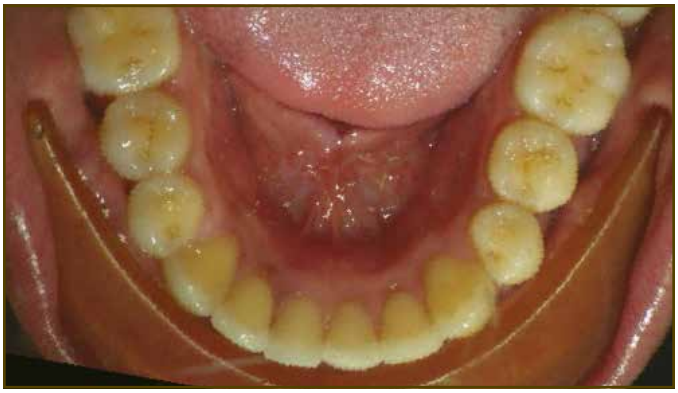

Figure 2: after treatment. Note that the patient was referred to a GP in order to recontour the gingival margin of tooth #8.

Discussion

This patient was very self-conscious and did not like to smile when he first came to my practice. I started him on a 14-day aligner wear interval with AcceleDent and placed his attachments when I delivered the third aligner. He eventually progressed to changing his aligners every 4 days.

This case was challenging because I had to bodily move the right central incisor (tooth #8), moving the root of the tooth along with the crown. If the patient had not been using AcceleDent, the incisor would have tipped and not translated, giving us a poor result. Upon reviewing the patient's final images, I noticed that the gum was very low on the incisor that had been moved, so I referred him to a GP who recontoured the gum on tooth #8.

The Ostreicher Theory was borne out here, as AcceleDent helped to ensure that the cells in the periodontal ligament were oxygenated throughout treatment, preventing the cells from dying while decreasing the amount of discomfort the patient experienced.

Having integrated AcceleDent into my standard of care with Clear Aligner Therapy cases, I'm noticing that teeth are tracking all the way throughout treatment when comparing progress to the ClinCheck. I'm also doing fewer refinements, and when I do need refinements, there are fewer aligners in each refinement. By gradually reducing the aligner wear intervals at each appointment, I'm using AcceleDent as a motivator that encourages patients to maintain compliance with aligners and AcceleDent.

I present my patients three options when they choose Clear Aligner Therapy: Classic, Turbo, and PM.

- Patients who choose Classic change their aligners every 7 to 14 days, and wear them 22 hours per day.
- The Turbo option instructs patients to use AcceleDent 20 minutes daily, change aligners every 4 to 10 days (based on their stage in treatment), and wear the aligners for 22 hours per day.
- We offer the PM option to professionals or students who can't commit to wearing aligners for 22 hours daily. These patients use AcceleDent daily, change aligners every 7 to 14 days, and only wear their aligners 16 to 19 hours per day.

The increased predictability that I achieve with AcceleDent enables me to manage patient expectations from the beginning of treatment while keeping them engaged and compliant throughout treatment. I'm consistently delivering quality clinical results, and patients are pleased that they can finish treatment faster with less discomfort. ■

References:

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